

What is claimed is:

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1. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound, which comprises: mixing a metal powder with a reinforcing material to obtain a mixed powder, fulfilling thus obtained mixed powder into a vessel, placing Al on an upper side of the mixed powder fulfilled into the vessel, and impregnating the mixed powder with an Al melt to give rise to a spontaneous combustion reaction between the metal powder and the Al melt to convert the Al melt into an aluminide intermetallic compound, wherein the Al melt and the metal powder are used respectively in such amounts that a mass ratio of a remaining Al after the spontaneous reaction to the intermetallic compound-based composite material is within a range from 0:10 to 3:7.

2. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 1, wherein Ti powder is used as said metal powder, and Ti powder is mixed with Al in a relative mass ratio of 1:0.34 to 1:0.57, taking the mass of Al as 1.0.

3. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 1, wherein Ni powder is used as said metal powder, and Ni powder is mixed with Al in a relative mass ratio of 1:0.47 to 1:0.72, taking the mass of Al as 1.0.

4. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 1, wherein

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Nb powder is used as said metal powder, and Nb powder is mixed with Al in a relative mass ratio of 1:0.75 to 1:1.13, taking the mass of Al as 1.0.

5. A process for producing an intermetallic compound-

5 based composite material comprising a reinforcing material and an intermetallic compound according to claim 1, wherein said metal powder is mixed with Al in such amounts that Al does not remain substantially after the spontaneous combustion reaction.

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10 6. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 5, wherein Ti powder as a metal powder is mixed with Al in a relative mass ratio of 1:0.57 to 1:6.14, taking the mass of Al as 1.0.

15 7. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 5, wherein Ni powder as a metal powder is mixed with Al in a relative mass ratio of 1:0.72 to 1:7.20, taking the mass of Al as 1.0.

20 8. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 5, wherein Nb powder as a metal powder is mixed with Al in a relative mass ratio of 1:1.13 to 1:12.16, taking the mass of Al as 1.0.

25 9. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 1, wherein a volumetric fraction of the reinforcing material in the intermetallic compound-based composite material is adjusted  
30 to 10 to 70% by volume.

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10. A process for producing an intermetallic compound-based composite material according to claim 1, wherein the reinforcing material is an inorganic material having a shape selected from the group consisting of fibrous shape,

5 particulate shape and whisker shape.

11. A process for producing an intermetallic compound-based composite material according to claim 11, wherein the reinforcing material is at least one member selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{AlN}$ ,  $\text{SiC}$  and  $\text{Si}_3\text{N}_4$ .

10 12. A process for producing an intermetallic compound-based composite material according to claim 1, wherein the metal powder has an average particle diameter corresponding to 5 to 80% of an average particle diameter of the reinforcing material.

15 13. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound: said process comprising; mixing a metal powder and an oxide powder reducible by Al with a reinforcing material to obtain a mixed powder,  
20 fulfilling thus obtained mixed powder into a vessel, placing Al on an upper side of the mixed powder fulfilled into the vessel, and impregnating the mixed powder with an Al melt to give rise to a spontaneous combustion reaction between the metal powder and the Al melt to convert the Al melt into an  
25 aluminide intermetallic compound, wherein Al, the metal powder and the oxide powder are used respectively in such amounts that a mass ratio of a remaining Al after the spontaneous combustion reaction to the intermetallic compound-based composite material is within a range from  
30 0:10 to 3:7.

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14. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 13, wherein said metal powder is mixed with Al in such amounts that Al  
5 does not remain substantially after the spontaneous combustion reaction.

15. A process for producing an intermetallic compound-based composite material comprising a reinforcing material and an intermetallic compound according to claim 13, wherein  
10 a volumetric fraction of the reinforcing material in the intermetallic compound-based composite material is adjusted to 10 to 70% by volume.

16. A process for producing an intermetallic compound-based composite material according to claim 13, wherein the  
15 reinforcing material is an inorganic material having a shape selected from the group consisting of fibrous shape, particulate shape and whisker shape.

17. A process for producing an intermetallic compound-based composite material according to claim 16, wherein the  
20 reinforcing material is at least one member selected from the group consisting of  $\text{Al}_2\text{O}_3$ , AlN, SiC and  $\text{Si}_3\text{N}_4$ .

18. A process for producing an intermetallic compound-based composite material according to claim 13, wherein the metal  
25 powder has an average particle diameter corresponding to 5 to 80% of an average particle diameter of the reinforcing material.

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